SUBMISSION INSTRUCTION NO. 6
CLOSURE AND POST-CLOSURE CARE PLANS
FOR SOLID WASTE DISPOSAL and MANAGEMENT FACILITIES

Developed by:

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I. CLOSURE PLAN (SOLID WASTE DISPOSAL FACILITIES) [§160.B., 360.2., 370, 470.A.2. and 480.D., 9 VAC 20-81-10] A Closure Plan is required for all solid waste disposal facilities and should be submitted with the Part B Application or Part B Modification Application as Attachment IV to DEQ Form SW PTB.

Format The format used for the Closure Plan should encourage clear analysis and presentation of the proposed landfill closure design. The Closure Plan should start with a title page and table of contents followed by the following sections and discussions. The title page should identify the facility name and permit number, the permit applicant, document date, and document preparer information. In addition, the header or footer of each page should include the facility name, permit number, document title, revision date, and page number.

A. ***Closure Purpose*** [§160.A., 9 VAC 20-81-10] Provide an introduction that identifies the type of solid waste disposal facility to be closed and describe how implementing the closure plan minimizes the need for post-closure maintenance and controls and/or minimizes surface run-off and the escape of waste decomposition products.

B. ***Closure Timeframes*** [§160.B.1.a. and 470.A.2., 9VAC20-81-10] Provide the anticipated date when wastes will no longer be received, the date when completion of final closure is anticipated, and intervening milestone dates that will allow tracking of the progress of closure. Discuss when specific portions of the landfill will reach final grades and be closed, referencing the appropriate Design Plans as necessary. Calculations substantiating the site life for each cell/phase/area to be closed should be provided as an attachment to this plan or to the Design Report (PTB Attachment VI).

C. ***Closure of Surface Impoundments and Lagoons*** [§370.A., 9 VAC 20-81-10] If a surface impoundment or lagoon is used to collect, store, and/or treat leachate generated by the solid waste disposal facility, information regarding the closure and decontamination of the unit shall be discussed here.

1. **Removal**. Describe how liquid wastes, waste residues, contaminated system components (i.e. liners, etc.), and contaminated subsoils will be removed and disposed.

2. **Stabilization**. Describe procedures to stabilize remaining waste residues in order to provide a competent bearing surface for the proposed final cover system. Indicate the required bearing strength and provide documentation and calculations as an attachment to this Closure Plan.

3. **Decontamination**. Describe how structures and equipment will be decontaminated.

4. **Final Cover**. Describe the final cover system to be installed. The final cover system shall meet the requirements of § 9 VAC 20-81-160.D.2.

D. ***Closure of Landfill Units*** [§160.D. and 470.A.2., 9 VAC 20-81-10]

1. **Final Cover Design** [§160.D.2., 9 VAC 20-81-10] Describe the final cover system to be installed, as indicated on DEQ Form SW PTB. Any additional layers to the pre-

approved alternate liner systems shall be discussed here. If the facility selected the "Additional Alternate" Final Cover Design on DEQ Form SW PTB, the liner layers shall be discussed here, and the demonstration assessing the design's suitability should be provided in PTB Attachment XVI (see Section IV below for additional information). For facilities proposing multiple cover systems, the following discussions should be provided for each proposed cover design, as applicable.

a. *Infiltration Layer* [§160.D.2.c.(1), d.(1), and f.(1), 9 VAC 20-81-10] Provide a description of the infiltration layer to be installed. Be sure to address the layer's height, material, and hydraulic conductivity. Reference the appropriate Technical Specification(s) provided in PTB Attachment VII.

b. *Barrier Layer* [§160.D.2.d.(2) and e.(1), 9 VAC 20-81-10] Provide a description of the barrier layer to be installed. Be sure to address the type and thickness of the geomembrane or geosynthetic clay liner and reference the appropriate Technical Specification(s) provided in PTB Attachment VII.

c. *Erosion Control / Protective Cover Layer* [§160.D.2.c.(2), d.(3), e.(2), and f.(2), 9 VAC 20-81-10] Provide a description of the erosion control/protective cover layer. Be sure to address the layer's thickness, material, and ability of the layer to protect the infiltration layer from the effects of erosion, frost, and wind. Reference the appropriate Technical Specification(s) provided in PTB Attachment VII.

   Describe how the calculations have demonstrated that the universal soil loss for the erosion control/protective cover layer is less than 2 tons/acre/year. Discuss the erosion control measures used so minimize soil loss while vegetation is being established.

d. *Vegetative Support Layer* [§160.D.2.d.(4), e.(3), and f.(2), 9 VAC 20-81-10] Provide a description of the vegetative support layer, addressing the layer's thickness, material, and ability to sustain native plant growth. Discuss the proposed cover crop, referencing the appropriate Technical Specification(s) provided in PTB Attachment VII.

2. **Final Slopes** [§160.D.3., 9 VAC 20-81-10] Provide information that addresses the minimum and maximum slopes for the side slope and flatter, top slope areas. Discuss the design features that protect the final slopes from the effects of runoff and erosion. Reference appropriate calculations demonstrating the stability of the layers of the final cover system.

3. **Run-off Controls** [§160.B.e., 9 VAC 20-81-10] Provide a description of design, construction, and maintenance controls for the stormwater management system. Reference the Design Plans and stormwater calculations as appropriate.

4. **Settlement, Subsidence, and Displacement** [§160.D., 9 VAC 20-81-10] Describe the effects of potential subsidence/settlement on the ability of the final cover to

minimize infiltration. Provide an estimate of the maximum amount of settlement of the final cover system that may occur. Additionally, an estimate of the settlement that must occur to result in failure of the final cover system must be provided for each component of the final cover.

E. ***Closure of Storage and/or Treatment Units*** [§360.2. and 480.D., 9 VAC 20-81-10] If the solid waste disposal facility operates one or more solid waste management facilities under their Solid Waste Permit, information addressing removal of waste materials and unit closure should be discussed here. Information to be provided is addressed below in Section II.

F. ***Schedule for Closure*** [§160.C.2., 9 VAC 20-81-10] Provide a schedule for completion of closure. If the closure time period is to exceed the time limit specified in the regulations, provide justification for the extension of the period and the description of steps necessary to eliminate any significant threat to human health and the environment from the unclosed but inactive facility.

G. ***Closure Implementation***

1. **Posting** [§160.D.5.a., 9 VAC 20-81-10] Describe how closing the site will be posted and how customers will be notified. Discuss the barriers to be erected to restrict access during and after completion of closure activities.

   For facilities that will remain open as a convenience center or that will continue to operate solid waste management units for waste storage and/or treatment, indicate how access to the landfill will be restricted.

2. **Notification** [§160.D.5.b. and c., 9 VAC 20-81-10] Provide the name of the local land recording authority that will be notified upon the completion of closure and the wording of the notification to appear in the deed of the facility.

3. **Certification** [§160.D.4. and D.5.d., 9 VAC 20-81-10] Provide the wording of the certification from a registered professional engineer indicating that the closure has been completed in accordance with the requirements of the regulations and the approved Closure Plan. Note that the certification must be submitted with the results of the QA/QC program.

H. ***Closure Cost Estimate*** [§90.A. and 111.A., 9 VAC 20-70-10] Provide an estimate for the cost of closing the landfill at the point in the facility's active life when closure would be the most expensive. The cost estimate shall be based on the costs of hiring a third party to close the facility and may not incorporate any salvage value that may be realized from the sale of wastes, facility structures or equipment, land or other facility assets at the time of partial or final closures. Worksheet 1 is provided as an attachment to this Submission Instruction for your use in determining the facility's closure cost estimate.

   If the solid waste disposal facility maintains areas for the storage and/or treatment of solid wastes, additional funds should be provided for the removal of those materials at the

time of closure. Calculations addressing such removal can be found in Section II.E. below.

I. ***Attachments***

1. **Site Life and Cell/Phase/Area Capacity Calculations.** Provide calculations substantiating the information provided in Section I.B.

2. **Universal Soil Loss Demonstration.** Provide calculations substantiating the information provided in Section I.D.1.c.

3. **Slope Stability.** Provide calculations showing the factors of safety are adequate to prevent (sliding, tearing, or pullout) failure of the cover layers based on the final slopes indicated in Section I.D.2.

4. **Stormwater Calculations.** Provide an estimate of peak run-off and volume (based on a 25-year 24-hour storm) and calculations indicating the size of the designed drainage swales, piping, and/or ditches is sufficient to handle this flow. Calculations provided should substantiate information provided in Section I.D.3.

5. **Settlement, Subsidence, and Displacement.** Provide calculations addressing the potential cover settlement, subsidence, and displacement, considering immediate settlement, primary consolidation, secondary consolidation, and liquefaction. Include information on potential foundation compression, potential soil liner settlement, and potential waste consolidation resulting from waste dewatering, biological oxidation and decomposition, and chemical conversion of solids to liquids. Calculations presented here should substantiate information provided in Section I.D.4.

6. **Closure Cost Estimate.** Provide a copy of the closure cost calculations substantiating the closure cost estimate provided in Section I.H.

II. CLOSURE PLAN (SOLID WASTE MANAGEMENT FACILITIES) [§360.2. and 480.D., 9 VAC 20-81-10] A Closure Plan is required for all solid waste management facilities and should be submitted with the Part B Application or Part B Modification Application as Attachment IV to DEQ Form SW PTB, for those facilities pursuing a full solid waste permit.

Format The format used for the Closure Plan should encourage clear analysis and presentation of the proposed steps for closing the solid waste management facility. The Closure Plan should start with a title page and table of contents followed by the following applicable sections and discussions. The title page should identify the facility name and permit number, the permit applicant, document date, and document preparer information. In addition, the header or footer of each page should include the facility name, permit number, document title, revision date, and page number.

A. ***Closure Purpose*** [§360.1., 9 VAC 20-81-10] Provide an introduction that identifies the type of solid waste management facility to be closed and describe how implementing the closure plan minimizes or eliminates the post-closure escape of uncontrolled leachate, surface run-off, or waste decomposition products to the groundwater, surface water, or to the atmosphere.

B. ***Closure Timeframes*** [§360.2.a., 360.3.a., and 480.D., 9VAC20-81-10] Provide the anticipated date when wastes will no longer be received, the date when completion of final closure is anticipated, and intervening milestone dates that will allow tracking of the progress of closure. VSWMR § 9 VAC 20-81-360.3.a. specifies that closure shall occur within six (6) months after receiving the final volume of waste; if the planned closure activities will take longer than this timeframe to complete, the applicant shall provide supporting information here so the Director can make his determination.

C. ***Inventory Removal & Disposal*** [§360.1. and 480.D., 9 VAC 20-81-10]

1. **Waste Removal.** Describe how stored solid waste and residuals will be removed and disposed.

2. **Decontamination.** Describe how the solid waste management facility will be decontaminated, including procedures that will be followed during closure to manage solid waste residues, contaminated system components (i.e. liners), contaminated subsoils, structures, and equipment contaminated with waste or leachate.

3. **Sampling & Testing Program.** Describe the sampling and testing program to be employed to verify decontamination of subsoils and equipment. If it is determined that all contaminated subsoils can not be practicably removed or decontaminated, the facility shall close the facility and perform post-closure care in accordance with standards established for solid waste disposal facilities (§ 9 VAC 20-81-160 and § 9 VAC 20-80-170, respectively).

D. ***Closure Implementation***

1. **Posting** [§360.3.b., 9 VAC 20-81-10] Describe how closing the site will be posted and how customers will be notified. Discuss the barriers to be erected to restrict access during and after completion of closure activities.

2. **Certification** [§360.2.e., 9 VAC 20-81-10] Provide the wording of the certification from a registered professional engineer indicating that the closure has been completed in accordance with the requirements of the regulations and the approved Closure Plan.

3. **Post-Closure Use** [§480.D., 9 VAC 20-81-10] Specify any proposed alternate uses of the facility once closure has been completed.

E. ***Closure Cost Estimate*** [§90.A. and 111.A., 9 VAC 20-70-10] Provide an estimate for the cost of closing the landfill at the point in the facility's active life when closure would be the most expensive. The cost estimate shall be based on the costs of hiring a third party to close the facility and may not incorporate any salvage value that may be realized from the sale of wastes, facility structures or equipment, land or other facility assets at the time of partial or final closures. Either of the following methods may be used to calculate closure costs:

1. **Process rate cited in the facility permit.** If a process rate is referenced in the facility permit, the cost estimate may be based on one-half the throughput in tons per day (TPD) plus the total on-site storage capacity in tons for all waste materials (i.e. tires, materials proposed for beneficial use at an alternate facility, etc.) multiplied by $70 per ton. The storage piece of the equation does not apply to materials excluded from the definition of solid waste as identified under §9 VAC 20-81-95. This is considered to incorporate the costs for all closure activities.

   Closure Costs in dollars = [½ (Process rate, TPD) + (Storage Capacity, tons)] x $70/ton

2. **Process rate not cited in the facility permit.** In the event that the facility permit does not contain a daily process rate, the estimated maximum on-site storage may be determined on the basis of the dimensions of the tipping floor or waste piles. An estimated maximum on-site storage can be calculated using the area of the tipping floor or waste pile (in square feet) and an average waste pile height. This volume can be used to determine an estimated tonnage and cost.

   Closure costs in dollars = (Area of tipping floor or waste pile - length (feet) x width (feet)) x (Height of waste pile (feet)) x (0.037 cy/cf) x (0.4 tons/cy) x ($70/ton)

In the case of facilities that collect leachate, costs associated with the removal of leachate should be included in the closure cost estimate. The cost estimate should cover the cost of hauling and disposing of the maximum leachate storage capacity at the prevailing industrial rate for the appropriate wastewater treatment facility.

III. POST-CLOSURE CARE PLAN [§170.A.2. and 470.A.3., 9 VAC 20-81-10] The Post-Closure Care Plan should be submitted with the Part B Application or Part B Modification Application as Attachment V to DEQ Form SW PTB. A Post-Closure Care Plan is only required for those facilities closing with waste remaining in place.

Format The format used for the Post-Closure Care Plan should encourage clear analysis and presentation of the proposed landfill closure design. The Post-Closure Care Plan should start with a title page and table of contents followed by the following sections and discussions. The title page should identify the facility name and permit number, the permit applicant, document date, and document preparer information. In addition, the header or footer of each page should include the facility name, permit number, document title, revision date, and page number.

A. ***Post-Closure Period*** [§170.B., 9 VAC 20-81-10] Provide an introduction that identifies the type landfill and the length of the post-closure care period required under § 9 VAC 20-81-170.B.2.

B. ***Post-Closure Contact*** [§170.A. 2.b., 9 VAC 20-81-10] Indicate the name, address, and telephone number of the person or office to contact during the post-closure period.

C. ***Inspection, Monitoring, and Maintenance Plan*** [§170.A.1., 170.A.2.a., and 470.A.3., 9 VAC 20-81-10] Provide a description of the inspection, monitoring, and maintenance activities to take place during the post-closure care period for each of the following:

1. **Security Control Devices**. Indicate the frequency of inspections to be performed to ensure the landfill security has not been breached. Identify procedures for repairing and/or replacing security features if found damaged.

2. **Final Cover Integrity**. Indicate the frequency of inspections to be performed to assess the condition of the final cover and maintenance activities to be performed to correct for the following conditions:

   a. Erosion damage;

   b. Final cover settlement, subsidence, and displacement;

   c. Bare or dead vegetative cover; and

   d. Presence of woody-stemmed vegetation.

   Also, be sure to indicate how often landfill areas will be reseeded and/or fertilized and mowed. The post-closure cost estimate provided in Section III.E should account for the frequencies stated here.

3. **Run-on and Run-off Controls**. Indicate the frequency of inspections to be performed to assess the condition of stormwater run-on and run-off controls and maintenance activities to be performed to remove sediment and/or vegetation from conveyance and storage structures;

4. **Leachate Collection System**. The facility shall maintain a Leachate Management Plan (LMP) as described in Submission Instruction No. 10 that should address

inspection, monitoring, and maintenance of the leachate collection system and the facility's response to leachate seeps. This plan should be included as PTB Attachment VIII with the Part B Application or Part B Modification Application and should be referenced here.

If a LMP has not been incorporated into the facility's permit, information regarding the inspection, monitoring and maintenance activities relating to the leachate collection system and response to leachate seeps as required under § 9 VAC 20-81-210 shall be discussed here.

5. **Groundwater Monitoring System**. The facility shall maintain a Groundwater Monitoring Plan (GMP) as described in Submission Instruction No. 5, 11, or 12 that should address inspection, monitoring, and maintenance of the groundwater monitoring system. This plan should be included as PTB Attachment X with the Part B Application or Part B Modification Application and should be referenced here.

   In accordance with § 9 VAC 20-81-370.A.2.b., facilities operating surface impoundments or lagoons shall install a groundwater monitoring system and initiate groundwater monitoring in accordance with the requirements of §9 VAC 20-81-250 upon closure. Facilities that have closed a surface impoundment or lagoon and don't already have a Groundwater Monitoring Plan in place shall submit a GMP at closure for review and approval.

6. **Landfill Gas Monitoring System**. The facility shall maintain a Landfill Gas Monitoring Plan (LFGMP) as described in Submission Instruction No. 13 that should address inspection, monitoring, and maintenance of the landfill monitoring system. This plan should be included as PTB Attachment IX with the Part B Application or Part B Modification Application and should be referenced here.

D. ***Post-Closure Uses*** [§170.A.2.c., 9 VAC 20-81-10] Describe the planned uses of the property during and after the post-closure period. Discuss the measures that will be taken to protect the integrity of the landfill cover and other waste management features. Provide for the notification of approval by DEQ if the site use changes during the post-closure care period.

E. ***Post-Closure Cost Estimate*** [§90.B. and 112.A., 9 VAC 20-70-10] Provide an estimate for the cost of conducting post-closure care in accordance with the Post-Closure Care Plan. The cost estimate shall be based on the costs of hiring a third party to conduct post-closure care over the entire post-closure care period. Worksheet 2 is provided as an attachment to this Submission Instruction for your use in determining the facility's post-closure cost estimate.

F. ***Post-Closure Care Termination*** [§170.B.3. and C., 9 VAC 20-81-10] Procedures for terminating Post-Closure Care are provided in Waste Guidance Memo 01-2007: Post-Closure Care Termination. The format of the termination request, evaluation, and certification is addressed in Submission Instruction No. 20.

G. ***Attachments***

1. **Inspection Checklist.** Provide a copy of the inspection checklist(s) to be used during the post-closure care period to track self-inspections performed in accordance with Section III.C. of this Post-Closure Care Plan.

2. **Post-Closure Care Cost Estimate.** Provide a copy of the closure cost calculations substantiating the closure cost estimate provided in Section III.E.

IV. ALTERNATE FINAL COVER DEMONSTRATION [§160.B.4. and 160.D.2.f., 9 VAC 20-81-10] If the solid waste disposal facility selected the "Additional Alternate" Final Cover Design on DEQ Form SW PTB, the liner layers shall be discussed in the Closure Plan (Section I, above), and the demonstration assessing the design's suitability should be provided in PTB Attachment XVI. Facilities proposing to use an alternate final cover design shall provide a revised Closure Plan and Alternate Final Cover Demonstration at least 180 days prior to the date the facility anticipates beginning closure.

A. ***Infiltration Layer*** [§160.D.c.(1) and D.2.f.(1), 9 VAC 20-81-10] Provide documentation and calculations indicating the proposed infiltration layer achieves an equivalent reduction in cap infiltration as 18 inches of earthen material that has a hydraulic conductivity less than or equal to the hydraulic conductivity of the landfill unit's bottom liner or a hydraulic conductivity no greater than 1 x 10-5 cm/sec, whichever is less.

B. ***Erosion Layer*** [§160.D. 2.f.(2), 9 VAC 20-81-10] Provide documentation and calculations indicating the proposed erosion layer will be a minimum of 24 inches thick and will be capable of maintaining native plant growth and will provide for protection of the infiltration layer from the effects of erosion, frost, and wind. Reference applicable sections of the Closure Plan as necessary.